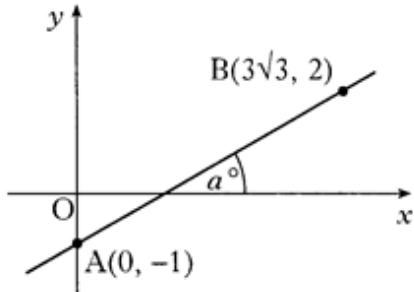
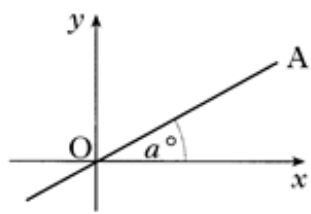
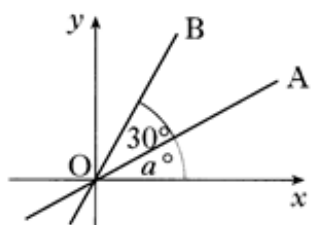
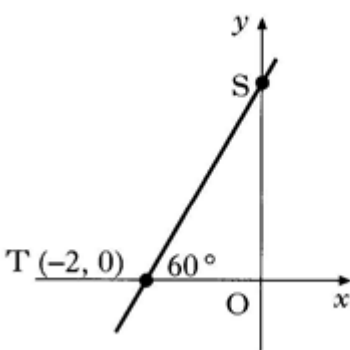


Straight Line

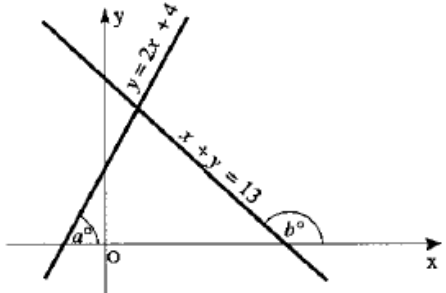
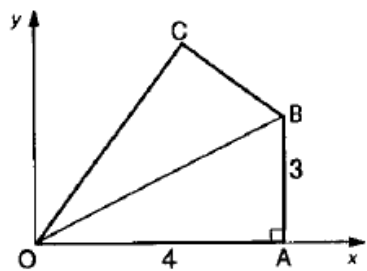
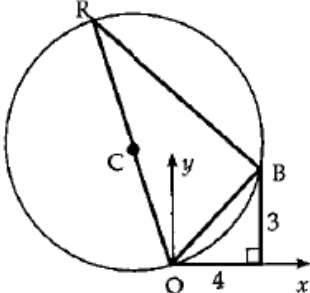
Pre 2000 Questions - Concurrency

1	Three lines have equations $2x + 3y - 4 = 0$, $3x - y - 17 = 0$ and $x - 3y - 10 = 0$. Determine whether or not these lines are concurrent.	4
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Gradient ($m = \tan \theta$)

00 P1	<p>A3. Find the size of the angle a° that the line joining the points $A(0, -1)$ and $B(3\sqrt{3}, 2)$ makes with the positive direction of the x-axis.</p> 	3
3. (JAN) 02 P1	<p>(a) Find the equation of the straight line through the points $A(-1, 5)$ and $B(3, 1)$.</p> <p>(b) Find the size of the angle which AB makes with the positive direction of the x-axis.</p>	2 2
04 P2	<p>1. (a) The diagram shows line OA with equation $x - 2y = 0$. The angle between OA and the x-axis is a°. Find the value of a.</p>  <p>(b) The second diagram shows lines OA and OB. The angle between these two lines is 30°. Calculate the gradient of line OB correct to 1 decimal place.</p> 	3 1
05 P1	<p>1. Find the equation of the line ST, where T is the point $(-2, 0)$ and angle STO is 60°.</p> 	3
2015 SP P1	<p>5. Line l_1 has equation $\sqrt{3}y - x = 0$.</p> <p>(a) Line l_2 is perpendicular to l_1. Find the gradient of l_2.</p> <p>(b) Calculate the angle l_2 makes with the positive direction of the x-axis.</p>	2 2

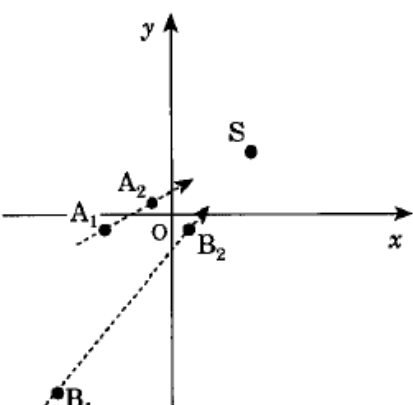
Pre 2000 Questions - Gradient ($m = \tan \Theta$)

1	The points A and B have coordinates (a, a^2) and $(2b, 4b^2)$ respectively. Determine the gradient of AB in its simplest form.	2
2	<p>The lines $y = 2x + 4$ and $x + y = 13$ make angles of a° and b° with the positive direction of the x-axis, as shown in the diagram.</p> <p>(a) Find the values of a and b.</p> <p>(b) Hence find the acute angle between the two given lines.</p>	 <p>4 1</p>
3	The line AB makes an angle of $\frac{\pi}{3}$ radians with the y -axis, as shown in the diagram. Find the exact value of the gradient of AB.	2
4	<p>The diagram shows a kite OABC.</p> <p>A is the point (4,0) and B is the point (4,3).</p> <p>Calculate the gradient of OC correct to two decimal places.</p>	 <p>3</p>
5	<p>The right-angled triangle OAB with sides of length 3cm, 4cm and 5cm is placed with one vertex at the origin as shown in the diagram.</p> <p>A circle centre C and diameter RO of length 13cm is drawn and passes through O and B.</p> <p>What is the gradient of the line RO?</p>	 <p>5</p>

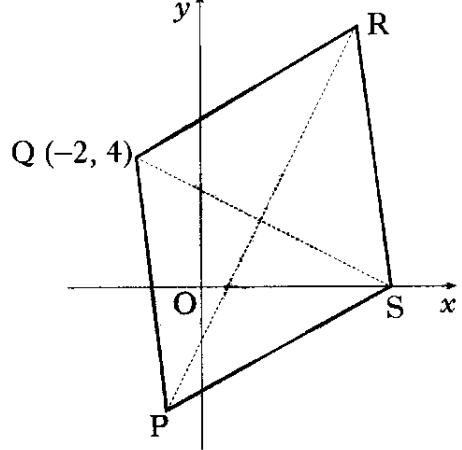
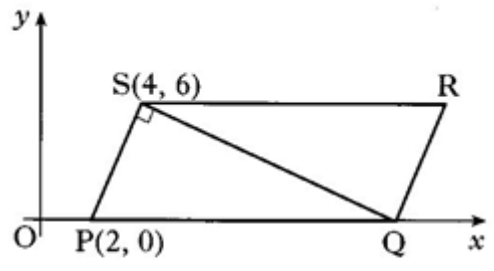
Collinearity

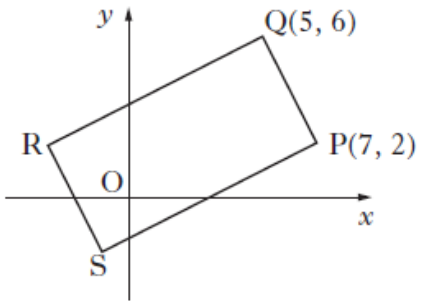
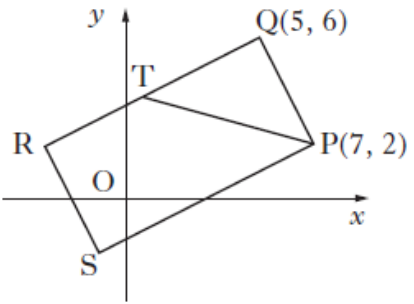
2015 P1	<p>9. A, B and C are points such that AB is parallel to the line with equation $y + \sqrt{3}x = 0$ and BC makes an angle of 150° with the positive direction of the x-axis.</p> <p>Are the points A, B and C collinear?</p>	3
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Pre 2000 Questions - Collinearity

1	<p>A Royal Navy submarine exercising in the Firth of Clyde is stationary on the seabed below a point S on the surface. S is the point (5, 4) as shown.</p> <p>A radar operator observes the frigate 'Achilles' sailing in a straight line, passing through the points A_1 (-4, -1) and A_2 (-1, 1). Similarly the frigate 'Belligerent' is observed sailing in a straight line, passing through the points B_1 (-7, -11) and B_2 (1, -1).</p> <p>If both frigates continue to sail in straight lines, will either or both frigates pass directly over the submarine?</p>	 <p>5</p>
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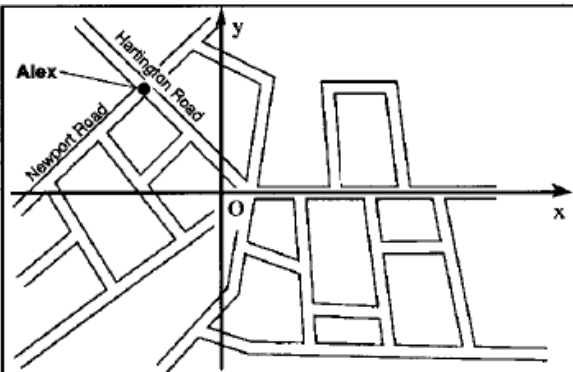
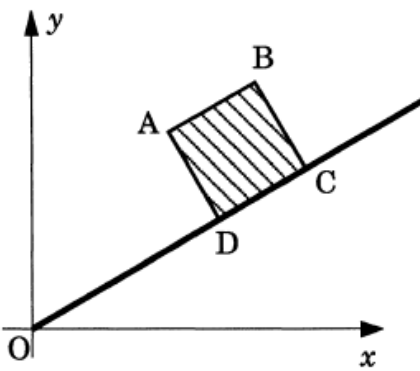
Parallel and Perpendicular Lines

01 P1	<p>1. Find the equation of the straight line which is parallel to the line with equation $2x + 3y = 5$ and which passes through the point (2, -1).</p>	3
<p>4. (JAN) 02 P2</p>	<p>The diagram shows a rhombus PQRS with its diagonals PR and QS.</p> <p>PR has equation $y = 2x - 2$.</p> <p>Q has coordinates (-2, 4).</p> <p>(a) (i) Find the equation of the diagonal QS.</p> <p>(ii) Find the coordinates of T, the point of intersection of PR and QS.</p> <p>(b) R is the point (5, 8). Write down the coordinates of P.</p>	 <p>6</p> <p>2</p>
03 P1	<p>1. Find the equation of the line which passes through the point (-1, 3) and is perpendicular to the line with equation $4x + y - 1 = 0$.</p>	3
04 P1	<p>1. The point A has coordinates (7, 4). The straight lines with equations $x + 3y + 1 = 0$ and $2x + 5y = 0$ intersect at B.</p> <p>(a) Find the gradient of AB.</p> <p>(b) Hence show that AB is perpendicular to only one of these two lines.</p>	<p>3</p> <p>5</p>
06 P2	<p>1. PQRS is a parallelogram. P is the point (2, 0), S is (4, 6) and Q lies on the x-axis, as shown.</p> <p>The diagonal QS is perpendicular to the side PS.</p> <p>(a) Show that the equation of QS is $x + 3y = 22$.</p> <p>(b) Hence find the coordinates of Q and R.</p>	 <p>4</p> <p>2</p>

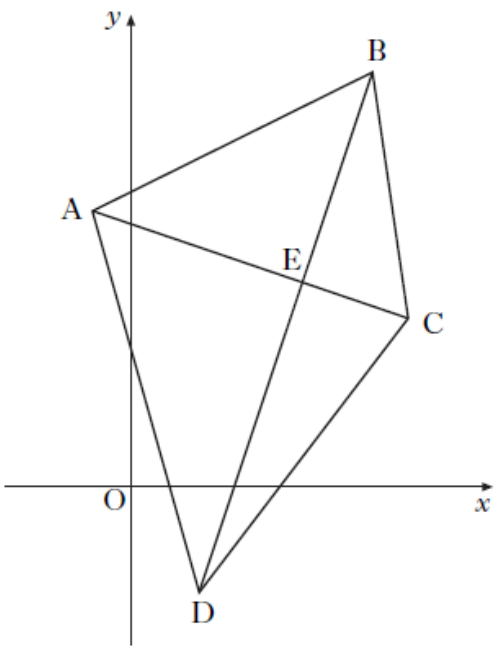
07 P1	1. Find the equation of the line through the point $(-1, 4)$ which is parallel to the line with equation $3x - y + 2 = 0$.	3
13 P2	<p>2. The diagram shows rectangle PQRS with $P(7, 2)$ and $Q(5, 6)$.</p>  <p>(a) Find the equation of QR.</p> <p>(b) The line from P with the equation $x + 3y = 13$ intersects QR at T.</p>  <p>Find the coordinates of T.</p> <p>(c) Given that T is the midpoint of QR, find the coordinates of R and S.</p>	<p>3</p> <p>3</p>
2016 P1	1. Find the equation of the line passing through the point $(-2, 3)$ which is parallel to the line with equation $y + 4x = 7$.	2
2017 P1	<p>11. A and B are the points $(-7, 2)$ and $(5, a)$.</p> <p>AB is parallel to the line with equation $3y - 2x = 4$.</p> <p>Determine the value of a.</p>	3

Pre 2000 Questions - Parallel and Perpendicular Lines

1	Find the equation of the line through the point $(3, -5)$ which is parallel to the line with equation $3x + 2y - 5 = 0$.	2
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2	<p>Relative to the axes shown and with an appropriate scale, Alex stands at the point $(-2, 3)$ where Hartington Road meets Newport Road.</p> <p>(a) Find the equation of Newport Road which is perpendicular to Hartington Road.</p> <p>(b) Brenda is waiting for a bus at the point $(-5, 1)$. Show that Brenda is standing on Newport Road.</p>		3 1
3	<p>P, Q and R have coordinates $(1, -2)$, $(6, 3)$ and $(9, 14)$ respectively and are three vertices of a kite PQRS.</p> <p>(a) Find the equations of the diagonals of this kite and the coordinates of the point where they intersect.</p> <p>(b) Find the coordinates of the fourth vertex S.</p>	(7) (2)	
4	<p>ABCD is a square. A is the point with coordinates $(3, 4)$ and ODC has equation $y = \frac{1}{2}x$.</p> 	(a) Find the equation of the line AD. (b) Find the coordinates of D. (c) Find the area of the square ABCD.	(3) (3) (2)

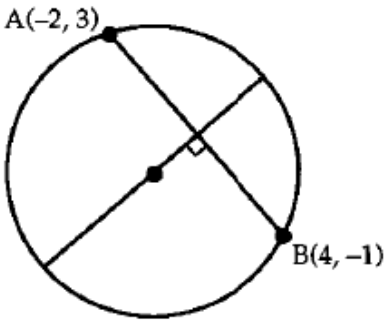
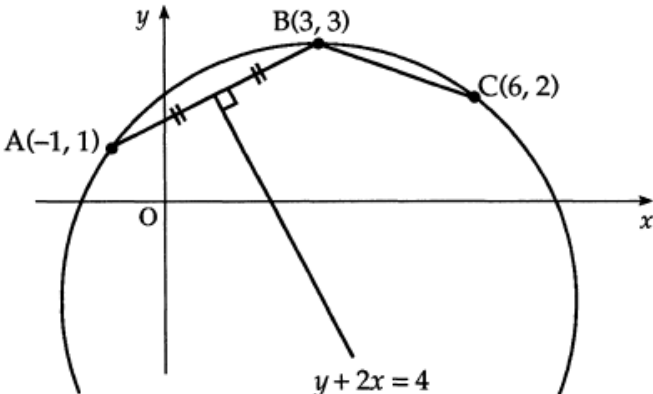
Perpendicular Bisectors

11 P1	<p>21. A quadrilateral has vertices A(-1, 8), B(7, 12), C(8, 5) and D(2, -3) as shown in the diagram.</p>  <p>(a) Find the equation of diagonal BD. 2</p> <p>(b) The equation of diagonal AC is $x + 3y = 23$. Find the coordinates of E, the point of intersection of the diagonals. 3</p> <p>(c) (i) Find the equation of the perpendicular bisector of AB. (ii) Show that this line passes through E. 5</p>
12 P1	<p>23. (a) Find the equation of ℓ_1, the perpendicular bisector of the line joining P(3, -3) to Q(-1, 9). 4</p> <p>(b) Find the equation of ℓ_2 which is parallel to PQ and passes through R(1, -2). 2</p> <p>(c) Find the point of intersection of ℓ_1 and ℓ_2. 3</p> <p>(d) Hence find the shortest distance between PQ and ℓ_2. 2</p>
2015 EP P1	<p>6. (a) Find the equation of l_1, the perpendicular bisector of the line joining P (3, -3) and Q (-1, 9). 4</p> <p>(b) Find the equation of l_2 which is parallel to PQ and passes through R (1, -2). 2</p> <p>(c) Find the point of intersection of l_1 and l_2. 3</p> <p>(d) Hence find the shortest distance between PQ and l_2. 2</p>

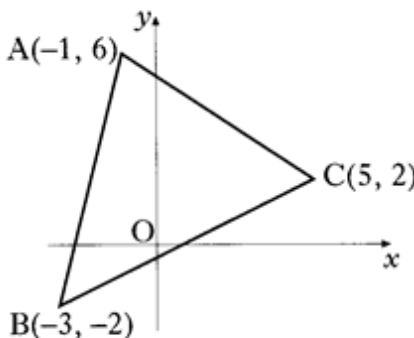
2015 SP P1	<p>9. (a) AB is a line parallel to the line with equation $y + 3x = 25$. A has coordinates $(-1, 10)$. Find the equation of AB. 1</p> <p>(b) $3y = x + 11$ is the perpendicular bisector of AB. Determine the coordinates of B. 5</p>
2017 P2	<p>1. Triangle ABC is shown in the diagram below. The coordinates of B are $(3, 0)$ and the coordinates of C are $(9, -2)$. The broken line is the perpendicular bisector of BC.</p> <div data-bbox="475 562 1043 1099" data-label="Figure"> </div> <p>(a) Find the equation of the perpendicular bisector of BC. 4</p> <p>(b) The line AB makes an angle of 45° with the positive direction of the x-axis. Find the equation of AB. 2</p> <p>(c) Find the coordinates of the point of intersection of AB and the perpendicular bisector of BC. 2</p>

Pre 2000 Questions - Perpendicular Bisectors

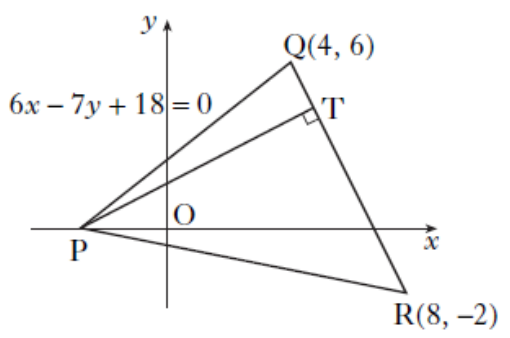
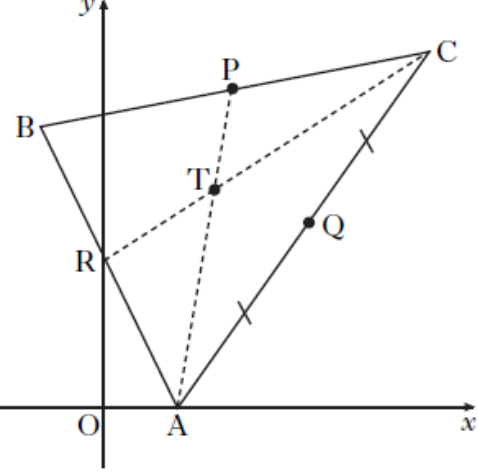
1	<p>A and B are the points $(-3, -1)$ and $(5, 5)$. Find the equation of</p> <p>(a) the line AB</p> <p>(b) the perpendicular bisector of AB.</p> <div data-bbox="895 1597 1310 1888" data-label="Figure"> </div> <p style="text-align: right;">2, 3</p>
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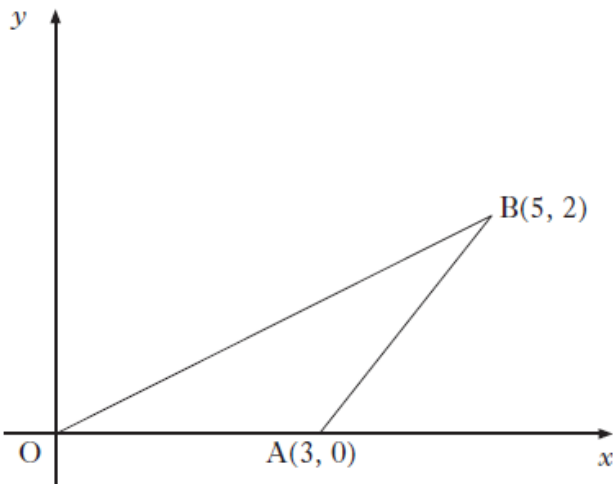
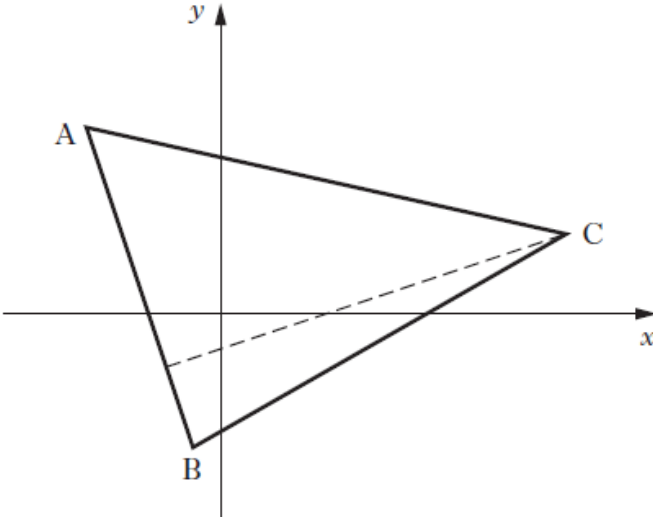
2	A circle passes through $A(-2, 3)$ and $B(4, -1)$. Find the equation of the perpendicular to the chord AB .		4
3	Find the equation of the perpendicular bisector of the line joining $A(2, -1)$ and $B(8, 3)$.		4
4	<p>(a) In the diagram, A is the point $(-1, 1)$, B is $(3, 3)$ and C is $(6, 2)$. The perpendicular bisector of AB has equation $y + 2x = 4$. Find the equation of the perpendicular bisector of BC.</p>  <p>(b) Find the centre of the circle which passes through A, B and C.</p>	(4)	
5	<p>(a) Find the equation of the straight line through the points $A(-1, 5)$ and $B(7, -3)$.</p> <p>(b) Find the size of the angle which the line AB makes with the positive direction of the x-axis.</p> <p>(c) Find the distance between A and B.</p> <p>(d) Find the equation of the line perpendicular to AB which passes through A.</p> <p>(e) Find the equation of the perpendicular bisector of AB.</p>	2 2 2 2 2	

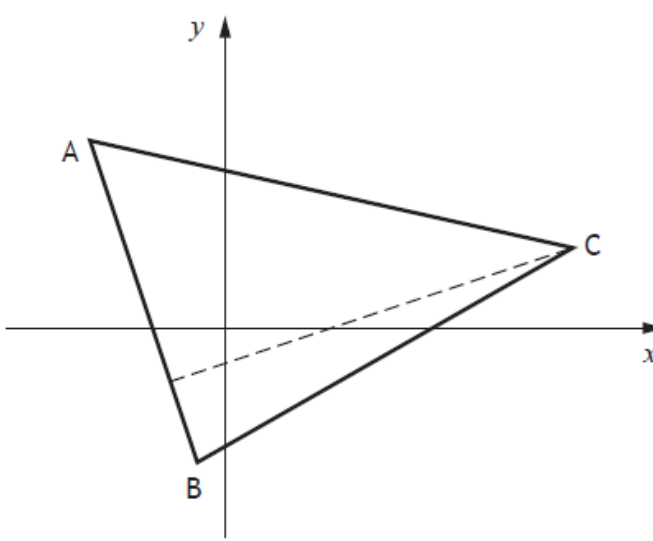
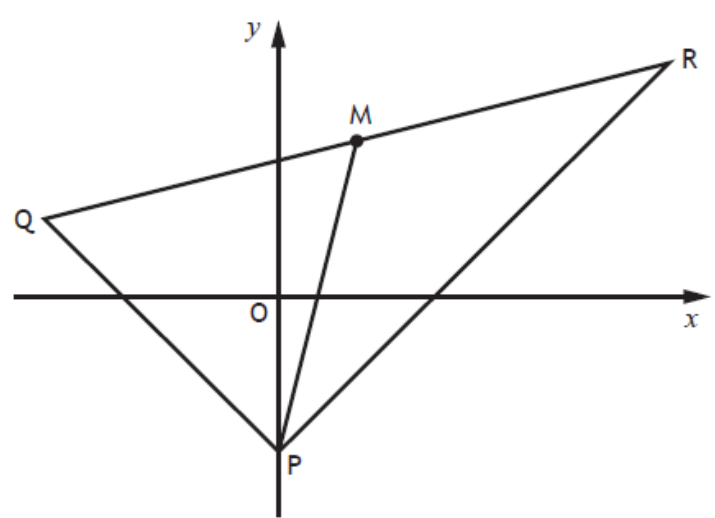
Lines in Triangles

02 P2	<p>1. Triangle ABC has vertices $A(-1, 6)$, $B(-3, -2)$ and $C(5, 2)$. Find</p> <p>(a) the equation of the line p, the median from C of triangle ABC.</p> <p>(b) the equation of the line q, the perpendicular bisector of BC.</p> <p>(c) the coordinates of the point of intersection of the lines p and q.</p>		3 4 1
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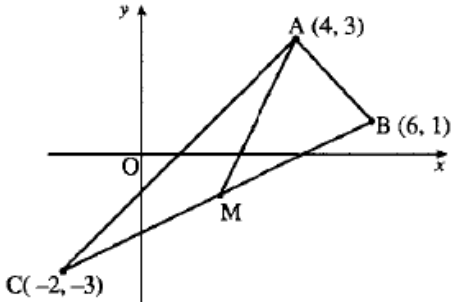
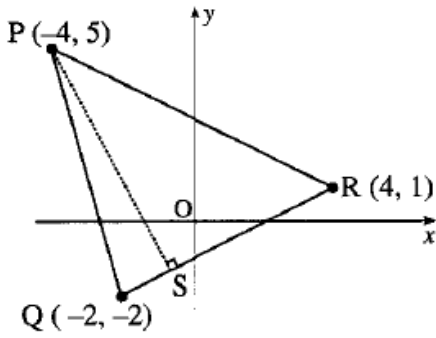
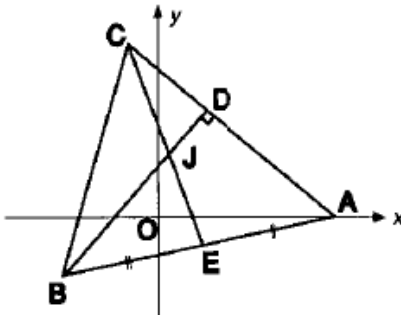
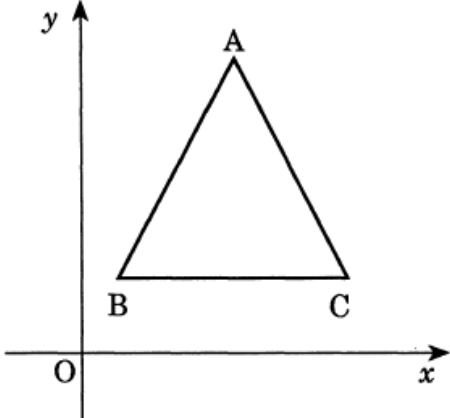
06 P1	<p>1. Triangle ABC has vertices $A(-1, 12)$, $B(-2, -5)$ and $C(7, -2)$.</p> <p>(a) Find the equation of the median BD.</p> <p>(b) Find the equation of the altitude AE.</p> <p>(c) Find the coordinates of the point of intersection of BD and AE.</p> <div data-bbox="783 114 1378 797"> </div> <div style="text-align: right;"> <p>3</p> <p>3</p> <p>3</p> </div>
08 SP P2	<p>1. Triangle ABC has coordinates $A(2, 1)$, $B(10, 1)$ and $C(4, 7)$.</p> <p>(a) Find the equation of the median CN.</p> <p>(b) Find the equation of the altitude AD.</p> <p>(c) The median from (a) and the altitude from (b) intersect at P. Find the coordinates of P.</p> <p>(d) The point Q lies on AB and has coordinates $(8, 1)$.</p> <p>Show that PQ is parallel to BC.</p> <div data-bbox="868 837 1366 1137"> </div> <div style="text-align: right;"> <p>3</p> <p>3</p> <p>3</p> <p>2</p> </div>
08 P2	<p>1. The vertices of triangle ABC are $A(7, 9)$, $B(-3, -1)$ and $C(5, -5)$ as shown in the diagram.</p> <p>The broken line represents the perpendicular bisector of BC.</p> <p>(a) Show that the equation of the perpendicular bisector of BC is $y = 2x - 5$.</p> <p>(b) Find the equation of the median from C.</p> <p>(c) Find the coordinates of the point of intersection of the perpendicular bisector of BC and the median from C.</p> <div data-bbox="874 1391 1273 1928"> </div> <div style="text-align: right;"> <p>4</p> <p>3</p> <p>3</p> </div>

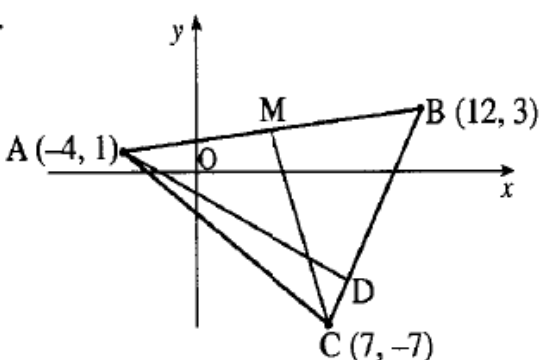
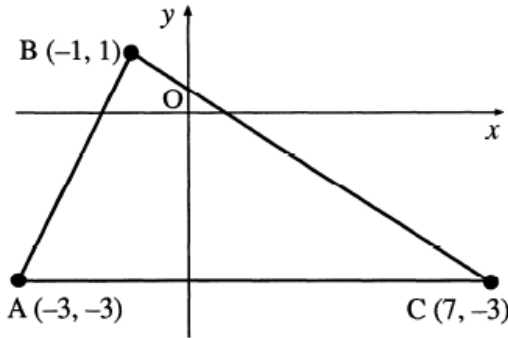
09 P1	<p>21. Triangle PQR has vertex P on the x-axis, as shown in the diagram. Q and R are the points (4, 6) and (8, -2) respectively. The equation of PQ is $6x - 7y + 18 = 0$.</p> <p>(a) State the coordinates of P. 1</p> <p>(b) Find the equation of the altitude of the triangle from P. 3</p> <p>(c) The altitude from P meets the line QR at T. Find the coordinates of T. 4</p>	
10 P1	<p>21. Triangle ABC has vertices A(4, 0), B(-4, 16) and C(18, 20), as shown in the diagram opposite. Medians AP and CR intersect at the point T(6, 12).</p> <p>(a) Find the equation of median BQ. 3</p> <p>(b) Verify that T lies on BQ. 1</p> <p>(c) Find the ratio in which T divides BQ. 2</p>	

14 P2	<p>1. $A(3, 0)$, $B(5, 2)$ and the origin are the vertices of a triangle as shown in the diagram.</p>  <p>(a) Obtain the equation of the perpendicular bisector of AB. 4</p> <p>(b) The median from A has equation $y + 2x = 6$. Find T, the point of intersection of this median and the perpendicular bisector of AB. 2</p> <p>(c) Calculate the angle that AT makes with the positive direction of the x-axis. 2</p>
15 OLD P2	<p>1. The vertices of triangle ABC are $A(-5, 7)$, $B(-1, -5)$ and $C(13, 3)$ as shown in the diagram. The broken line represents the altitude from C.</p>  <p>(a) Show that the equation of the altitude from C is $x - 3y = 4$. 4</p> <p>(b) Find the equation of the median from B. 3</p> <p>(c) Find the coordinates of the point of intersection of the altitude from C and the median from B. 2</p>

<p>2015 P2</p>	<p>1. The vertices of triangle ABC are $A(-5, 7)$, $B(-1, -5)$ and $C(13, 3)$ as shown in the diagram.</p> <p>The broken line represents the altitude from C.</p>  <p>(a) Show that the equation of the altitude from C is $x - 3y = 4$. 4</p> <p>(b) Find the equation of the median from B. 3</p> <p>(c) Find the coordinates of the point of intersection of the altitude from C and the median from B. 2</p>
<p>2016 P2</p>	<p>1. PQR is a triangle with vertices $P(0, -4)$, $Q(-6, 2)$ and $R(10, 6)$.</p>  <p>(a) (i) State the coordinates of M, the midpoint of QR. 1</p> <p>(ii) Hence find the equation of PM, the median through P. 2</p> <p>(b) Find the equation of the line, L, passing through M and perpendicular to PR. 3</p> <p>(c) Show that line L passes through the midpoint of PR. 3</p>
<p>2017 P1</p>	<p>7. $A(-3, 5)$, $B(7, 9)$ and $C(2, 11)$ are the vertices of a triangle.</p> <p>Find the equation of the median through C. 3</p>

Pre 2000 Questions – Lines in Triangles

1	Find the equation of the median AD of triangle ABC where the coordinates of A, B and C are $(-2, 3)$, $(-3, -4)$ and $(5, 2)$ respectively.	3
2	<p>A triangle ABC has vertices $A(4, 3)$, $B(6, 1)$ and $C(-2, -3)$ as shown in the diagram. Find the equation of AM, the median from A.</p> 	3
3	<p>$P(-4, 5)$, $Q(-2, -2)$ and $R(4, 1)$ are the vertices of triangle PQR as shown in the diagram. Find the equation of PS, the altitude from P.</p> 	3
4	The vertices of a triangle are $P(-1, -1)$, $Q(2, 1)$ and $R(-6, 2)$. Find the equation of the altitude of triangle PQR, drawn from P.	3
5	<p>In the diagram A is the point $(7, 0)$, B is $(-3, -2)$ and $C(-1, 8)$. The median CE and the altitude BD intersect at J.</p> <p>(a) Find the equations of CE and BD.</p> <p>(b) Find the co-ordinates of J.</p> 	6, 2
6	<p>A triangle ABC has vertices $A(4, 8)$, $B(1, 2)$ and $C(7, 2)$.</p>  <p>(a) Show that the triangle is isosceles. (2)</p> <p>(b) (i) The altitudes AD and BE intersect at H, where D and E lie on BC and CA respectively. Find the coordinates of H. (7)</p> <p>(ii) Hence show that H lies one quarter of the way up DA. (1)</p>	

7	<p>A triangle ABC has vertices A $(-4, 1)$, B $(12, 3)$ and C $(7, -7)$.</p> <p>(a) Find the equation of the median CM. (b) Find the equation of the altitude AD. (c) Find the coordinates of the point of intersection of CM and AD.</p>  <p style="text-align: right;">3, 3, 3</p>
8	<p>A triangle ABC has vertices A $(-3, -3)$, B $(-1, 1)$ and C $(7, -3)$.</p> <p>(a) Show that the triangle ABC is right-angled at B. (3)</p>  <p>(b) The medians AD and BE intersect at M.</p> <p>(i) Find the equations of AD and BE. (5)</p> <p>(ii) Hence find the coordinates of M. (3)</p> 